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A VISIT TO THE COLONY OF SPOONBILLS NEAR AMSTERDAM.

By HENRY SEEBOHM, F.Z.S.

IN 'The Ibis' for 1877, Dr. Sclater and Mr. Forbes, the Secretary and Prosector of the Zoological Society of London, wrote a most interesting account of their visit to the Horster Meer, between Amsterdam and Utrecht, and strongly advised their brother ornithologists, who should be travelling in Holland, by no means to miss seeing the nesting-place of the Spoonbills. In the spring of the present year Capt. Elwes and I spent some time in Jutland, and on our return journey we went out of our way to follow the advice of Dr. Sclater, and were so much interested in what we saw that I can only recommend all readers of 'The Zoologist' who are interested in bird-nesting to go and do likewise. I have seen many breeding colonies of birds in various parts of the world, but seldom one which interested me more than the one concerning which I extract a few notes from my journal.

When I was in Amsterdam last year with Dr. Sclater, he introduced me to M. Westermann, the Director, and to M. Hegt, the Assistant-Director, of the excellent Zoological Gardens of that city. Immediately on our arrival in Amsterdam we visited the Gardens, and expressed our wish to the gentlemen I have named to visit Horster Meer. With the kindness which I have invariably received from all continental ornithologists, they not only gave us every information we required, but provided us with a guide, whose local knowledge of Botany and Zoology largely added to the interest of the trip. We travelled by rail from Amsterdam to Hilversum, passing at first through a district of low meadow country intersected by dykes, and afterwards across somewhat more elevated land, for the most part barren sandy heath. The date was the 23rd of May; the day was uninterrupted brilliant sunshine, but a stiff breeze was blowing, which naturally had the effect of making large birds wild on the wing, and of causing small birds to skulk in the shelter of the alders and willows.

Hilversum is the Tivoli of Amsterdam; and we drove for a mile or so through a charming country, full of the villas of Amsterdam merchants, nestled in beech and oak woods, and surrounded by garden-plots, gay with flowers and shrubs, but whose beauty in English eyes was somewhat marred by the regulation white statues of the country. An hour's drive brought us out of the woods and gardens to an immense plain, stretching away on each side of the road almost as far as the eye could reach; lakes, swamps, marshes, and willow-beds, intersected by a river, and, in places where the ground was firm enough for pasture, with dykes. Passing through several straggling villages, the inhabitants of which seemed to be principally occupied in peeling willow, to be afterwards woven into baskets, and mending fishing-nets, we travelled for some distance alongside the River Vecht. The second hour's drive with a good horse brought us to Overmeer-an-de-Vecht, a small village close to the Horster Meer, the lake on whose shores the Spoonbills were reported to breed.

Our guide conducted us to the house where Mynheer Van Dyk, the lessee of the Horster Meer used to reside. Here we learned that he was no longer living, but we discovered the new lessee, sitting on the ground, smoking his pipe and mending his nets. He informed us that he pays a rent of about £420 a-year for the Meer, which probably includes the annual crop of willow-twigs, the fishing, and the winter's shooting, together with the eggs. The man who was employed to collect the eggs was absent, but he volunteered to take us in his boat to the Meer, and to try and find the breeding-place for us, which, strange to say, he had evidently never visited, at least during this season. We rowed for a short distance between willow-beds until the dyke became too narrow for oars, when our new friend the lessee jumped on to the bank and towed us along for some distance. At first we were disappointed not to see a crowd of birds. Occasionally we saw a Black Tern or a Cormorant, and at length had the pleasure of seeing two pairs of Spoonbills. On landing we found ourselves on marshy ground, thickly overgrown with reeds and *Carices*, amongst which were growing two rare species of British ferns, *Lastræa thelipteris*, abundantly, and *Lastræa cristata*, sparingly. The ground was also diversified with a considerable variety of wild flowers, such as marsh mallow, ragged robin, &c. For some distance we passed amongst alder- and willow-bushes, but beyond was open ground leading to the Meer. In our ignorance we made for this open ground, disturbing a large flock of perhaps five hundred Cormorants. We could see their nests in the distance, but passed them by in pursuit of the Spoonbills.

Suddenly we came upon the object of our search. A flock of at least two or three hundred of these curious birds rose behind the alder-bushes, their white wings glittering in the sun, in strong contrast to their black legs stretched out behind, and their dark bills projecting so conspicuously in front. For some time they flew about like the Gannets at the Bass Rock, but we detected no cry from them; indeed, they seem to be remarkably silent birds.* We made for the direction from which they rose, keeping to the open ground, and looking in vain for the nests, being misled by our guide, who was evidently entirely ignorant of their breeding haunts, though living almost within gunshot of them. We carefully searched the ground as near to the Meer as we could go without actually wading, until we had long passed the place from which the flock must have risen. Finding nothing we turned our backs upon our guide and returned to the alder-bushes. Here we came upon three nests; one that of a Spoonbill on a grassy tussock, containing one egg; the second that of a Purple Heron, about four feet from the ground, containing two eggs; and the third another Spoonbill's nest, with one egg, in a similar situation to that of the Heron. All these nests were alike—a few sticks outside, a principal structure of reeds, and a lining of dead grass.

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* Since writing the above, Mr. Harting has called my attention to a notice of the peculiar formation of the vocal organs of the Spoonbill (Yarrell, Hist. Brit. Birds, ed. 3, vol. ii., p. 602), where it is stated, "This bird is one of the very few which has been found to possess no true muscles of the organs of voice, and no modulation of its single tone appears to be possessed by the bird."

Passing on, still in the alder plantations, we came to the place from whence the flock must have risen when we first came to the locality; and we were not long in finding the main colony, which consisted of perhaps fifty nests. Nearly all of them were on the ground, and within a radius of some twenty yards. Some contained one egg, others two, for they had probably all been robbed on the Saturday previous to our visit. Most of the nests were on grassy tussocks, but a few were in the alder trees; and the effluvium from the droppings of the birds was so strong that we should have discovered the locality at once had not a strong gale been blowing all the day. Upon our invasion of their nesting-place most of the birds flew right away, but small parties of five or six were always on the wing near at hand. Their powerful heron-like wings enabled them to sail along for considerable distances without much exertion; and I noticed that they had a habit of dropping their legs occasionally, probably to assist them in keeping their balance in the high wind. We selected a fine series of eggs, and then turned our attention to the hitherto neglected Cormorants.

This colony was on the open ground near the lake. As we approached we occasionally found a few outlying nests, built in the willow-bushes which were here and there growing in the marsh. The main colony was an interesting sight. A bare piece of ground, with a radius of not more than six or seven yards, contained two hundred nests, in many places touching each other. The nests were piles of sticks and reeds from one to four feet high, and lined with a small quantity of fresh grass. Every year it would seem that a new nest was built upon the remains of the old one, and the locality has apparently been occupied for many years. All traces of vegetation has long ago been burnt off by the superabundance of manure; the ground and the sides of the nests were white with the droppings of the birds, and scattered here and there were fishes, some half-a-pound in weight, and in various stages of decomposition. Most of the nests were empty, perhaps fifty of them containing one egg each. When we first came up the birds were on the nests, and the place was black with them; but as we approached they rose, and, after flying round for some little time, alighted on the lake. We counted the nests, selected a few eggs, and made notes on the interesting scene, during which time we were occasionally visited by detachments of Cormorants, who came to watch our movements, and then return to the main flock on the lake. The day was very unfavourable for small birds; but we heard the Cuckoo, Sedge Warbler, Chiffchaff, and Willow Wren, besides seeing Starlings, Jackdaws, Magpies, and Sparrows.

The eggs of the Spoonbill varied much in size, shape and colour. Some were long and narrow, with the small end almost as blunt as the large end, and scarcely varied in shape from the typical eggs of the Cormorant. Others, again, were so round that they might easily have been passed off by unprincipled dealers as eggs of the Kite. Many were scarcely spotted at all; in others the whole surface was evenly, but somewhat sparingly, sprinkled over with chestnut-brown spots; whilst in others the spots were accumulated in a zone round the large end, and frequently confluent. In one nest I picked up a small egg, almost round, not much larger than that of a Little Owl. As was to be expected, when I came to blow it I found that it contained no yoke.

NOTES ON THE FRESH-WATER FISHES OF INDIA.

By Francis Day, F.L.S.

(Continued from p. 437.)

The common Perch, at half-a-pound weight, has been found to contain 20,000 ova or upwards; at nearly three pounds, 127,240; at over three pounds, 155,620; and in one, the size of which is not mentioned, Picot found nearly 1,000,000. They are about the size of poppy-seeds, glued together by mucus into stringy bands or mesh-work, having much resemblance to frog-spawn. The female selects a spot where rushes, reeds, or grass grow in the water, or else seeks a piece of wood, or some hard substance, against which she rubs herself, or presses until one end of the gelatinous band of ova has become attached, then gently swimming away, the eggs are voided. The Sticklebacks, both marine and fresh-water, form nests for the reception of their eggs, as do many tropical fishes. The siluroids, *Ariinæ*, appear to have a still more difficult task to perform, as the male carries about the large eggs in his mouth until hatched, or it may be that he only removes them from some spot when danger is imminent. However this may be, I have netted many with from fifteen to twenty of the eggs in their mouth, and one example contained a young fry hatched, but with the yelk-bag still adherent. In none was there any trace of food in the intestines. Lastly, I will allude to the tufted-gilled fishes, represented by the pipe and horse-fishes of the British seas. In them also the males perform the function of hatching the eggs, which for that purpose are deposited up to the time of the evolution of the young between the ventral fins, as in the *Solenostomus*, in tail-pouches as in horse-fishes, or in pouches on the breast and abdomen, as in the pipe-fishes, *Doryrhamphus*, or merely in rows, in the same place as in *Nerophis*.

One very interesting question respecting fish-eggs is whether their germination can be by any means retarded? Great difficulty was experienced some years since when attempting to transmit young fish from Europe to the Antipodes, and it was naturally argued that it would be far better if some means could be devised for transporting the eggs and hatching them subsequent to their arrival. This, it was evident, could not be effected unless their germination could be retarded, or the eggs would be hatched while at sea, where the young would most certainly perish. Count Goldstein in the middle, and Bloch at the end of the last century, made many experiments as to the feasibility of fish being hatched artificially; while the latter also investigated whether it were possible to convey the ova in safety for any considerable distance. He proposed placing the eggs of pond-fish in mud, similar to that existing in the locality from whence the eggs were procured, and he thought that when dry they could be removed without injury from one pond to another. His proposal was originally based on the theory that frequently on dried-up ponds being refilled with water young fish appear, and which could only be due to the eggs having been present in the mud, but with their germination suspended. Yarrell likewise supported this plan being attempted; but, so far as I know, it does not appear to have been yet tried. In India, as ponds or tanks dry up, some of the fish contained therein descend into the mud, where they æstivate until the rains of the succeeding year set in. As these commence and the mud softens, and subsequently liquefies, fish are perceived diverging in all directions up every watercourse, no matter how small, or how lately it may have been quite dry, while in a few days fry are distributed everywhere. Where the eggs do come from which have produced these fry is a very interesting subject of investigation.

Have they remained within the mother fish, and has their germination been retarded so long as she continued in the exsiccated mud? Did she deposit them as soon as the rains set her free? I cannot believe this theory to be tenable; first, because the fish I have seen removed alive from the mud had no ova in them; and secondly, because the fry were so soon hatched after the setting in of the rains, while none of these fishes are ovi-viviparous. It seems more reasonable to suppose that the fertilised eggs are imbedded in the mud, and, as soon as the rains occur, become hatched out; and this would give us reason to believe success might result if this plan were tried with the ova of pond-fishes. Could large numbers of eggs be safely conveyed in dried mud to distant countries, a considerable amount of the present difficulty in their transport would have been overcome. The Bishop of Norwich, at a meeting of the British Association in 1875, "related several facts, showing that the spawn of fishes may be conveyed from one country to another over the sea. He knew an instance in which the ova of the Pike were deposited in the thatch of a cottage, and after having remained there for years, on the thatch being thrown into a dry ditch, which afterwards became filled with rain, young Pike appeared"! (Annals Nat. Hist., 1845, p. 1026). A most valuable discovery was made by Mr. Youle, in 1854, that fertilised Salmon and Trout ova could have their germination retarded by means of ice. He packed the eggs in moss, which was placed in a side wooden box of inch pine, having perforated sides, and these boxes were covered over with ice, by which means the ova were conveyed in safety to the Antipodes, where they were subsequently hatched out.

Although I have no intention of entering upon the interesting subjects involved in the artificial propagation of fish, I think it necessary to remark how—if great cold be employed in retarding germination—excessive warmth may have an opposite and very deleterious effect; and by warmth I do not allude only to that which is present, but to the fact of its being in proportion to what the ova would have retained in their natural habitat. For it cannot be supposed that the amount of heat which is normal to fish-eggs in the tropics is such as might with impunity be applied to those which are naturally hatched within the arctic circle of the limits of Northern Europe. Dr. Davy concluded from his experiments on Salmon ova, that the ova were capable of bearing a temperature of about 80° or 82° in water for a moderate time with impunity, but not without loss of life at a higher temperature—any exceeding 84° or 85°. The fish which take the longest time to hatch normally are, as a rule, the strongest, and this will be influenced by the temperature of the water, while too much warmth injures the fry. Forty to fifty degrees has been considered best for Trout or Salmon ova, 48° to 50° is as high as is safe; 52° to 55° brings them on too rapidly, while 55° is as high as the fry should be exposed to. During the last half of May and the first half of June, 1866, I made some observations upon the temperature of the Bowany River, at the base of the Neilgherry Hills, in the Madras Presidency, this period being the common breeding season for many species of fish residing there. The temperature at 6 a.m., 79°; at 12 a.m., 92°; 4 p.m., 86°; 6 p.m., 82°. Subsequent to the first burst of the monsoon, which occurred before June 20th, I found it—6 a.m., 70°; 12 a.m., 79°; 6 p.m., 78°. In Burma, during June, 1869, I took eighty-five observations as to the heat of the water in the Irrawaddi River; one foot beneath the surface it averaged 83°, and varied from 82° to 85°, whereas in the Een-gay-gyee Lake I found 90° at 11 a.m.

The methods employed to capture the fresh-water fishes in the East are exceedingly numerous, but space will merely permit me to enumerate some few of them. Prior to doing this, I propose shortly adverting to how the fisheries of India and Burma have been and how they are now worked. From the information collected between 1869 and 1873 it appeared that fisheries in olden times were royalties, mostly let out to contractors, who alone in their respective districts possessed the right to sell fish, while they, as a rule, permitted the people, on payment, to capture sufficient for their own households. It was, in fact, a license on payment, resumable at will. Remains of this custom still exist in Lahore, while the leasing of fisheries is even now in force in many portions of the Indian Empire. Along the Himalayas in the Kangra and other districts the petty rajahs adopt a somewhat different method. To some persons they give licenses to supply the fish-markets, of which they virtually made them monopolists, while others obtained licenses for fishing with small nets for home consumption, but not for sale. In Burma, under native rule, a similar plan was carried out. There were no free fisheries; but inhabitants had the privilege—or perhaps right—to fish for home consumption on the payment of a fixed annual sum to the contractor for the district in which they resided. It is believed that under native rule the erection of fishing weirs was permitted in several of the streams in the Himalayas, but not to the extent that they are at the present day. In some districts landowners even now raise an income from the fisheries, claiming a third of the captures or a certain amount of money. Some of our officials consider that as Government has permitted indiscriminate fishing the exercise of long practice has converted such into a communal right.

As British rule has gradually superseded that of the native princes, so the modes in which fisheries were leased has become widely different, and mostly obsolete. In permanently settled estates, unless a stipulation to the contrary exists, they go with the land. In some localities it has been decided that the adjacent villagers or people possess certain communal rights with respect to them, due, it seems most probable, to a misapprehension. Although it has been proved that the landowner never received more than one-third of the produce, this does not demonstrate that the other two-thirds were public property, but that such expressed the share accruing to the fisherman in return for his labour in capturing the fish. It is the rule in India and Burma to remunerate by the proceeds; sometimes the working fisherman has to dispose of his share to the contractor or lessee at a given rate; more rarely, the fish are sold, and he receives a proportion of the returns, or he may be paid in kind. In some localities the British Government has leased fisheries, or imposed a tax on the implements of fishing, or a capitation tax upon the fishermen, but without interfering with the manner in which the fisheries were conducted. By degrees the tax on fishing implements was taken off, but the fishermen still became poorer, and in 1849—at least in Madras—many leased fisheries were thrown open to the public, eventuating, as they were not regulated, in unlimited license, and thus an intended boon resulted in their depopulation. In Burma the practice of employing fixed engines in irrigated fields and watercourses very largely increased when the native *régime* became abolished, as did also the custom of throwing weirs across creeks and minor streams. If individuals are permitted to help themselves to fish from fisheries as they please, they will assuredly employ the means which give them the least amount of trouble, and thus the breeding fish and fry fall victims to man's rapacity, unchecked by wholesome enactments. Nor can the fishermen be blamed. The result would be the same in Europe as in the East if the like permission existed.

Free fisheries have been permitted, owing to several causes, such as the difficulty in making them sufficiently remunerative to bear taxation or the incidence of rent, which may be due to the rapidity of the current, the paucity of fish, as in some hill-streams and depopulated rivers, the depths of tanks, the presence of foreign substances in them, or the poverty of the general population. How general and indiscriminate fishing ruins fisheries, without any commensurate benefit accruing to the public I have already pointed out. In these deteriorated but public fisheries, as soon as the monsoon has set in, and the fry are commencing to move about, women and children are daily engaged in searching for them in every sheltered spot where they have retired for security, for, not being able to face strong currents or live in deep waters, they naturally resort to the grassy but inundated borders of rivers and tanks. Every device that can be thought of is now called into use; nets which will not permit a mosquito to pass are employed; even the use of cloths may be frequently observed. Neither are the agricultural population idle. They construct traps of wicker-work, baskets, and nets; these traps permit nothing but water to pass, and a fish once inside is unable to return, as they resemble some of our commoner kinds of rat-traps. So soon as fish, for the purpose of breeding, commence passing up the small watercourses at the sides of rivers and streams, these implements of capture come into use; breeding fish are taken, and the few which surmount the obstructions find the traps reversed, so that, although they have ascended in safety, it is by no means improbable that their return to the river will yet be cut off. In Burma a large triangular-shaped basket is employed in places where trapping is difficult, and a pair of buffaloes having been harnessed to it, it is dragged through the localities inhabited by the fry. Even when there are no restrictions, fishermen often find it advantageous to ply their occupation in concert. Sometimes large bodies of villagers proceed at certain seasons of the year to rivers which can be easily bunded, having done which, they kill every fish they are able.

The fixed engines employed in India and Burma are mainly divisible into two forms—(1) those manufactured of cotton, hemp, aloe-fibre, coir, or some such material; and (2) those constructed of split bamboo, rattan, reed, grass, or some more or less inelastic substance. Those which are manufactured of elastic substances include all stake-nets, but when the meshes are of a fair size they are a legitimate means, when properly employed, for the capture of fish, but are occasionally to be deprecated, especially when used solely to take such as are breeding. But in some of these implements the size of the mesh is so minute that no fish is able to pass. There it stands, immovably fixed across an entire water-way, capturing everything, the water being literally strained through it. The meshes have been described as so minute that a large black ant could not pass, or that they would arrest a tamarind or a mustard-seed; or else they resemble the size of mosquito curtain-nets. In one instance, in the Punjab, a whole drove of Mahaseer were observed to be captured by natives fixing a net across a river, and then dragging another down to it, thus occasioning wholesale destruction, and ruining the rod-fishing for the succeeding season. This plan is a very common procedure throughout India, as is also the construction of earthen dams across streams, leaving a channel or opening through their centre, where a purse-net is fixed, and arrests every descending fish. The largest numbers are taken towards the end of the rainy season, for as the waters fall, countless lakes and pools of all sizes are formed on the low lands in the vicinity of rivers. These, which during the floods were lateral extensions of the stream, now become lakes having one or more narrow outlets into the river; across each opening nets are stretched, or a weir of grass constructed, and every fish which has wandered up becomes a certain prey to the fisherman.

Fixed engines constructed of non-elastic substances are still more destructive to fish than are such as are made of net, and which are more liable to be rent. Their forms are exceedingly numerous, their sizes infinite, while that of the interstices between the substances of which the weirs or traps are composed appear everywhere much the same, whether examined in the ghâts of Canara, the Yomas of Pegu, the Himalayas, or on the plains of India or Burma. Still, local influences must occasion some modifications. In hilly districts, as the monsoon floods subside and the impetuosity of the mountain torrents decreases, they can be erected without being liable to be washed away. Up the hill-streams (as I have already observed) some of the most valuable of the Carps ascend to breed, and there are now but few that are not weired, and the parent fishes have the greatest difficulty in reaching their spawning grounds. Some, however, surmount the difficulties opposing their ascent, a few deposit their spawn; this completed, the rains are now passing off, the force of the current lessening; and what now occurs to those fishes who commence descending—trying to regain their low-country rivers? I omit in this place how spearing, snatching, or snagging, netting, and angling are carried on, only noticing how fixed engines are employed. Weirs are now erected every few miles through which the waters of the hill-streams are literally strained, while each is fitted with a cruive or fishing-trap. The probabilities are that the great majority of the Mahaseer which reach ther ivers of the plains are the last year's fry that have fortunately escaped destruction during the dry months, and with the first floods have obtained a free highway by the standing weirs being swept away. Wicker traps are likewise constructed across convenient rapids; here few fish can pass without entering, while these are examined twice daily. Or, should there be no rapids, such are artificially formed by laying large stones in a V-shape across a stream, while at the apex of this is a trap; or a mountain stream is conducted down a slope over a large concave basket, so that all descending fish are pitched into it, and speedily suffocated by the rushing water or other falling fish, which act like a succession of blows, preventing their ever rising again.

In addition to the larger weirs and traps, there are minor sorts most extensively employed, especially in the plains—some to capture breeding fish ascending up the smaller watercourses during the rains to deposit their spawn; others to arrest them and their fry attempting to descend the stream as the flood-waters recede, and there is not a district, except perhaps in Sind, in which this mode of capture is not carried on; and some officials now speak of the use of these contrivances as communal and prescriptive rights, and their prohibition as an interference with private property!

Movable fishing implements are of two varieties—(1) those manufactured of cotton, hemp, aloe-fibre, coir, or some such material; and (2) those made of split bamboo, rattan, reed, grass, or other more or less inelastic substances. Large drag-nets, having fairly-sized meshes, are used mostly during the dry months, and employed for the purpose of obtaining fish from pools in rivers into which they have retired awaiting the next year's floods. But the movable nets which occasion the most damage are those with small meshes, and principally employed for taking the fry of the fish as they are first moving about; they may be cast-nets with fine meshes, wall-nets dragged up small watercourses, purse-nets similarly used, and even sheets may be thus employed. In some places several cast-nets are joined together to stop up all passage of fish along a stream, while others are employed above this obstacle; or several fishermen surround a pool, each armed with a cast-net, and these they throw all together, giving the fish but little chance of escaping. In Sind the fishermen in certain suitable localities float down the Indus upon a gourd or hollow earthen pot, while the net is let down beneath them; as a Hilsa-fish, *Clupea ilisha*, ascends up the muddy and rapid stream, it strikes against the dependent net, which is made to contract like a purse by means of a string that the fisherman holds in his hand.

Irrespective of the modes already detailed as in common use for capturing fresh-water fishes in India and Burma, there are a number of what may be termed minor plans likewise in force. Sheets have already been remarked upon as employed for taking the fry which have ascended small watercourses or are found in shallow water, while they may be also used as dip-nets, being sunk in an appropriate place, and raised by strings attached to the four corners as soon as the little fish have been enticed above; or on the sheet bushes may be placed: here the fry seek shelter from the rays of the sun, and the whole concern is lifted bodily up. A little grain or bread is likewise found useful as a bait. Two pieces of rattan may likewise be employed, crossing one another in the middle, where they are tied together; the ends are then bent downwards in the form of two arches. Here a net is attached, and this the fisherman presses down upon the fish, which are then removed by the hand. In some places they may be so absolutely frightened as to permit themselves to be readily taken; thus ropes to which at intervals are attached bones, leaves, stalks of kurbi or jowaree, or pieces of solar (pith), or small bundles of grass are stretched across a stream; two persons, one at either end, constantly jerk this rope, causing the fish to dart away towards nets that are fixed to entrap them.

Snares of the most varied description are almost universally employed; but in some localities angling may be said to be almost unknown, especially in Orissa, or districts where wholesale poaching is preferred as easier and more killing. One method of using hooks is perhaps as cruel as could well be devised. A number are securely fixed, at regular intervals of about three inches, to a line for employment in a narrow pass in a hill-stream. When used, the rope is sunk from eighteen inches to two feet below the surface, and held by a man on either bank; others drive the fish towards this armed cord, and as they pass over it the line is jerked for the purpose of hooking the fish. In some places dexterity has been arrived at by constant practice, and many fish are then captured. The object is to hook it by its under surface; but, as might be supposed, although in some cases the hooks penetrate sufficiently deep to obtain a secure hold, such is by no means invariably the case. The struggles of the wounded creature are frequently sufficient to cause it to break away, often with a portion of its intestines trailing behind it. If its gill-covers have been injured, respiration may be wholly or partially impeded; crippled, it wanders away to sicken and die in an emaciated state, while, should it be captured before death has stopped its sufferings, it is useless as food unless to the lower animals. Baited hooks are in some places fastened to lines, which are tied to bamboos fixed in the beds of rivers, or to bushes or posts at their edges, and so managed that when a fish is hooked the line runs out; or a somewhat similar plan is to have a cord stretched across a river, floated by gourds; to this the short lines which have the baited hooks are attached, but so that they are not long enough to reach the bottom; these are visited every few hours. In some districts night-lines are baited with frogs.

Spearing fish by torchlight is extensively practised in the Punjab and in the Presidency of Bombay; and they are speared during the daytime in the cold months of the year when they are not very active. Two persons usually engage in this occupation; one punts the boat along as noiselessly as possible, while the fisherman stands at the prow, silently pointing out the direction to be taken, and uses his spear when he gets a chance. Shooting fish with guns is carried on in Oude, and occasionally elsewhere. This is more generally employed for the Snake-headed Walking-fishes (*Ophiocephalidæ*), which are frequently seen floating on the surface of the water as if asleep. They may be approached very closely, but the game usually sinks when killed, and has to be dived for or otherwise obtained. Cross-bows are also employed for a similar purpose in Malabar. In Mysore, observed the native officials of the Nagar division, fish are taken by nets, traps, hooks, cloths, by the hand, by baskets of different shapes, by damming and draining off the water, by shooting, by striking them with clubs, with swords, or with choppers, by weirs, and by various descriptions of fixed engines; in short, by poaching practices of every kind, as well as by fishing with rods and lines, and poisoning pools of water. Even fishes' eggs do not escape the general hunt to which the persecuted finny tribes are subjected in these days, the ova being collected and made into cakes, which are considered great delicacies.

CORRIGENDA.—Page 431, ten lines from bottom, for "Roaches" read "Loaches." Page 436, top line, after "not" add "only."—F. DAY.

ON THE FLIGHT OF THE FLYING-FISH.

By C. O. WHITMAN.*

AMONG those animals that enjoy the much-envied power of flight, none has elicited such universal interest and comment as that anomalous member of the finny tribe, the Flying-fish. This fish owes its generic name to a curious belief which is said to have been current among the ancients. They supposed that the Flying-fish—"sea swallows" they called them—left the ocean at night and slept on shore, to avoid the attacks of their marine enemies. From this habit of "sleeping out" they were called *Exocœti*.

Besides *Exocœtus*, which includes between forty and fifty different species, there is a genus of Flying-fish called *Dactylopterus* (finger-winged), from the fact that the fin-rays extend, finger-like, beyond the margin of the fins. This genus, popularly named the Flying-gurnard, is represented by comparatively few species which inhabit the Atlantic, the Mediterranean Sea, the Indian Ocean and Archipelago, and the Japan Seas.

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* From the 'American Naturalist' for September. Slightly abridged.

To those who may never have had the opportunity to observe the flight of these fishes, it may seem a matter of no little surprise that it is still an unsettled question whether they fly or skim. The difference of opinion on this point is all the more remarkable, as the flying fish has been known at least since the time of Pliny and even Aristotle, and has always attracted the attention of voyagers. Although its aërial flight, to accomplish which it has to leave its native element, is not at all more remarkable than the sub-aquatic flight of the Guillemots, Grebes, Auks, and Penguins, all of which are accustomed to change temporarily their own element for that of the finny race, to move through the water with even greater rapidity than the fishes themselves, and to remain submerged longer than the Flying-fish remains above water; and although the modification of the fins for aërial locomotion is certainly not greater than that of the wings of the Auks and Penguins for flight under water; yet the testimony of able scientific witnesses in favour of the actual flight of *Exocœtus* has been often challenged by equally good observers, and plausible reasons have recently been urged against even the possibility of such flight.

It is maintained by many, perhaps the majority of observers, that the *Exocœti* are sustained by the parachute-like action of the pectoral fins, which they simply hold outstretched during their passage through the air. According to this view the fins exhibit none of that "poetry of motion" seen in the bird's wing, being capable of only a passive kite-like action, like the membrane-wings of the Flying Squirrel (*Pteromys*), the Flying Lemur (*Galeopithecus*), the marsupial Petaurists (*Petaurus*, Shaw), or the foot-web of the Flying Frog of Borneo.

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Burmeister, in his 'Reise nach Brasilien' (Berlin, 1853, p. 36), declares that he watched the Flying-fish for a long time, and saw with certainty "that they made no kind of movement with their large pectoral fins, but held them quietly outspread like a parachute."

In his well-known work on 'Animal Locomotion' (p. 98), Pettigrew says:—"Whether the Flying-fish uses its greatly-expanded fins as a bird its wings, or only as parachutes, has not, so far as I am aware, been determined by actual observation. Most observers are of opinion that these singular creatures glide up the wind, and do not beat it after the manner of birds; so that their flight (or rather leap) is indicated by the arc of a circle, the sea supplying the chord."

From a careful examination of the structure and action of these, fins Pettigrew was able to satisfy himself that "they act as true pinions within certain limits." That this restrictive phrase, "within certain limits," is intended to exclude a flapping motion is evident from the following:—"The flapping and gliding action of the wings constitute the difference between ordinary flight and that known as skimming or sailing flight. The flight of the Flying-fish is to be regarded rather as an example of the latter than the former, the fish transferring the velocity acquired by the vigorous lashing of its tail in the water to the air."

Pettigrew shows that all kinds of wings, when extended in flight, have a kite-like action, or a "combined parachute and wedge action," independent of any beating movement; and it is to this action alone that he refers when he says the pectorals "act as true pinions within certain limits."

So much for the negative testimony.

In favour of the flapping motion of these fins we have the testimony of Capt. de Freminville,* who says:—"I have been able to convince myself that they (Flying-fish) do actually fly, impressing upon their fins, which serve them as wings, a rapid movement—a species of vibration (*frémissement*)—which sustains them and causes them to advance through the air."

Speaking of these fish, which he saw on the way from Callao to Lima, De Tessan † says:—"J'ai très-bien vu un poisson-volant battre d'abord des ailes en l'air, et puis les faire vibrer en planant."

In the 'Reise der *Novara*' (1857-59), p. 109, occurs (according to Professor Möbius) the statement that "Careful observation enables one to see that the wing-like pectoral fins of the Flying-fish are capable of a vibrating movement, like the wings of a Grasshopper."

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A. v. Humboldt ‡ says:—"Notwithstanding the astonishing swiftness of their movement, one can convince oneself that the animal beats the air during its spring, *i.e.*, that it alternately opens and closes its pectoral fins."

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* Ann. des Sci. Nat., vol. xxi., p. 102, 1830.

† 'Voyage autour du Monde sur la Vénus,' Paris, 1844.

‡ 'Reise in die Aequinoctial-Gegenden des neuen Continents' (1815).

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I will now pass to my own observations on the flight of Flying-fish, made during a voyage from San Francisco to Yokohama, on the steamer 'City of Peking,' reserving till the last the consideration of the recent elaborate paper of Professor Carl Möbius.†

Of the nearly twenty-three days that elapsed between departure and arrival (1st to 24th August, 1879), at least ten were favourable for the study of the question under consideration.

Aware that these fish are now generally regarded as skimmers rather than flyers, notwithstanding the testimony of very trustworthy observers to the contrary, I determined to satisfy myself, if possible, on this one important point.

I found the most favourable place for observation to be the bow of the steamer, and the best hours to be in the morning from five till eight or nine o'clock, and in the afternoon between three and six o'clock. Observations made when the air was quiet and the sea perfectly smooth, so that the fish could often be seen before they left the water, were the most satisfactory and conclusive. A stiff breeze, a billowy sea, a tossing ship, and an easy chair are not conditions which facilitate accurate observation, and to such conditions, doubtless, is to be attributed the itl-success of many who have undertaken to decide this question.

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Under the favourable conditions just mentioned, it is by no means difficult to determine whether the fish executes any flapping movements with its pectoral fins. As I have seen them come out of the water directly under my eyes, I have been able to see distinctly the individual flaps of the large pectorals, while the ventrals were held in quiet expansion. The flapping movement, which is quite regular and rapid—so rapid that it is not easily recognised at any great distance until experience has sharpened the eye—may be continued for the whole or a part of the flight; but is generally discontinued after the first few rods, and the course completed by a pure skimming or sailing movement. In some cases I have seen the flapping of the fins renewed once or twice after short intervals of the sailing movement. In the case of young fish from a half to one and a half inches in length, many of which I saw leave their native element to essay the rarer medium, the strokes of the fins are continued throughout the short flight; and the resemblance between these tiny fin-flyers and flying insects is most striking.

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* "Die Bewegungen der fliegenden Fische durch die Luft" (Zeitschrift für Wissenschaftliche Zoologie, Supplement to vol. xxx., p. 343, 1878).

The course of the flight is generally in a straight or curved line; but on several occasions I have seen it abruptly changed, apparently by the aid of the tail, the lower lobe of which was brought for a moment into contact with the water.

In one instance I saw the course thus changed three times at intervals of only a few seconds. The fish came out of the water only a few feet from the steamer, flew outward and backward, then, suddenly turning, came towards the steamer, striking the crest of a wave within a few feet of the same, it darted alongside, and again dipping its caudal lobe in the water, wheeled directly away from the boat and plunged into the ocean. In the majority of observed cases, where the tail was made to touch momentarily the water, the course was not changed, the tail appearing to act, as Dr. Kneeland has already remarked, like a spring for raising the fish.*

In the case of a breeze, the direction of flight, as a rule, was either against that of the wind, or formed a more or less acute angle with it; not unfrequently, however, the flight is with the wind, or at right angles to it.

The longest flight observed lasted not less than forty seconds, and its extent was undoubtedly over eight hundred feet, and may have exceeded twelve hundred feet. This remarkably long flight began near the right side of the steamer, and was performed in a long curve, which formed at first nearly a right angle with the boat, then moving directly against a gentle wind, but gradually turned backward, so as finally to coincide nearly with the direction of the wind.

While the average flight does not perhaps exceed fifteen seconds, nor extend about four or five hundred feet, yet I have observed numerous cases in which it was continued twenty to thirty seconds.

That this flight, executed in a horizontal plane, which, according to the concurrent testimony of all observers, is seldom raised above the surface of the water by more than two or three feet, continued for ten to thirty or forty seconds, and extending a distance of one to eight or more hundred feet, can be due to the impetus gained by a single spring combined with the parachute-like action of the fins, seems to me, aside from the oft-repeated testimony of my eyes, quite incredible.

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* Proc. Boston Nat. Hist. Soc., 1872, p. 138.

It is maintained, however, by Prof. Möbius, in the article before mentioned, that the pectorals of the Flying-fish execute no flapping movement during flight; and this view is based not only on the author's observation of the flight of many *Exocœti* and one *Dactylopterus*, but also on anatomical and physiological grounds.

No one, so far as I know, has undertaken so elaborate a discussion of this question, and approached it from so many different standpoints as Prof. Möbius; and his conclusions will, on this very account, undoubtedly command the assent of many naturalists who have had no opportunity to settle the question for themselves. It is not, therefore, surprising to find that Prof. Bardeleben, in his review of this paper, in Hofman and Schwalbe's 'Jahresberichte über die Fortschritte der Anatomie und Physiologie' (vol. vii., part 1, p. 129), appears to accept as conclusive the opinion so ably maintained by Prof. Möbius. Had I not seen many times with my own eyes, under circumstances so favourable as to forbid all manner of doubt in my own mind, the flapping of these fins, I might have accepted the conclusions of the German naturalist, and overlooked the assailable points of the arguments adduced in their support; but with the positive assurance that he is in error on the main question, I have been led to question the validity of some of his interpretations of facts. That I have fairly stated the position of this author in regard to the function of the pectoral fins of the Flying-fish will appear evident from the following citations:—

"If during the entire flight the pectoral fins of flying fishes actually made motions similar to those of the wings of bats, birds, and insects, one would be able to perceive them quite as well as the strokes of equally large wings of bats and birds" (p. 353).

This statement is open to the objection that it entirely ignores the fact that the colour of the fins, the rapidity and sweep of their vibrations have a vast deal to do with the question whether the fin-strokes would be as easily recognised as the wing-strokes of the bird or bat.

"Flapping movements of the large shining pectorals would make themselves visible by the alternate appearance and disappearance of the light reflected from them. They would escape no accurate observer who viewed the fully-expanded pectorals from the height of a steamer. But as often and as long as I have been able to follow, with my eyes, Flying-fish, which came out of the water near our boat, I have never seen light reflected in this manner from the pectoral fins as from the wings of birds and bats" (p. 353).

That these movements have escaped Prof. Möbius is then evident from his own testimony: what application then is to be made of the statement that "they would escape no accurate observer?" This author first attempts to account for the fact that many good observers have affirmed the wing-like movement of the fins on historical and psycological grounds, asserting that this "false notion" had its origin in a fancied resemblance of these fishes to swallows, and that it has been handed down from the times of Aristotle and Pliny to the present time simply on authority; and afterwards, as if aware that this was not altogether a satisfactory solution of the question, admits that these observers may have had some grounds for their statements, but thinks they were deceived by appearances, which they did not understand, into the belief that the fins behave like wings. He is very frank in telling us just what these appearances are, although no one, not even Möbius himself, has ever observed such phenomena in a living *Exocœtus*.

"Just as a sail begins to slacken and vibrate the moment the wind blows parallel to its surface, so the more flexible and elastic distal and ventral parts of the pectoral fins are thrown into rapid vibrations when the air-current moves parallel to their surface" (p. 370).

As a simile, this will do very well, but how is it as a matter of fact? We are assured that this comparison is fully justified by the following simple experiment:—A specimen of *Exocœtus*, shrivelled, distorted, and stiffened by long soaking in alcohol, was suspended, and its pectorals exposed to a swift current of air in such a manner that the current swept along both surfaces. The fins thus exposed "made directly under my eyes the same rapid quivering movement that various good observers of Flying-fish have regarded as a flying movement" (p. 370, 371). It is important to observe that Möbius has here affirmed an identity without any authority whatever. He shows his deference to the statements of "good observers" by undertaking to sweep all their testimony out of court by the mere breath of his private opinion. Surely this is a most facile mode of reconciling contradictory testimony!

If Möbius merely announces it as his opinion that the tremulous movement observed in his experiment is identical with the movement that has been so often interpreted as a true flying movement, then we have simply to raise objections.

There are three questions here to be considered: 1st, whether the fins probably exhibit such movement; 2nd, whether such a movement, if made, would be probably recognised; and 3rd, whether, if recognised, it would likely deceive "good observers."

It would seem that the wings of a sailing-bird, such as a Gull or a Hawk, would be quite as likely to exhibit such motion as the fins of the Flying-fish; and it would be much more easily recognised in the former than in the latter.

With reference to this point I watched the long-winged Gulls that were seen almost every day of our voyage. These birds were often circling about the stern of the boat on the watch for waste bits of food, and were remarkably good skimmers, moving the most of the time without flapping the wings. I very rarely saw any vibratory movement that could be attributed to the wind alone, and never anything of the kind that was of more than a momentary duration. It is very evident that, under conditions that would render possible a continuous movement of this kind, the bird, as well as the fish, would inevitably fall to the water.

Is it probable that a momentary quiver in the comparatively small fin-wings of a swiftly-moving Flying-fish would be noticed? The fact that no naturalist has ever affirmed anything of the kind except Möbius, who bases his assertion on an experiment with an alcoholic specimen, is sufficient answer to this question.

As to the probability of any one being deceived by such motion, I cannot, of course, judge from experience, as I have never been so fortunate as, in the first place, to detect it, and, in the second place, to discover that I had erroneously interpreted it. I cannot persuade myself, however, that any "good observer" would be likely to make such an egregious blunder.

That Möbius does not regard this hypothetical quivering as in any sense a true flying movement, he states in the most unequivocal manner, and goes on to ask, "How, then, are the *Exocœti* able, without touching the water, to rise over the waves? For this also they make no fin-strokes. They do not raise themselves, but are passively raised by the ascending currents of air, which are caught in the grooves on the under surface of their pectoral fins" (p. 371). Notwithstanding the oft-repeated affirmation that Flying-fish do not actually fly, our author seems, in one place, to admit the possibility of the flapping of the fins during flight. "These explanations of the movement of the Flying-fish do not imply that an *Exocœtus* or a *Dactylopterus* cannot make powerful and plainly recognisable movements with its tail and pectorals during its ascent (out of the water), and even occasionally in the middle of its course, if prompted thereto by a strong wetting of the body by the waves" (p. 372).

This statement, interpreted in the light of the context, cannot be said, however, to involve a contradiction; the author simply means that the fins and tail may be used in getting out of the water, and that these movements may possibly be recognised just as the fish rises. But he still maintains that the wing-like movement attributed to them by many observers, "arises not through muscular action, but through the elasticity of the outspread fins and the pressure of the air, which act alternately against each other" (p. 353, 354).

Passing on from these explanations, which presume to reconcile conflicting statements by pronouncing all that will not be reconciled fallacious, and by substituting others of a less obstinate but of a purely hypothetical nature, which seem to admit of a quasi-explanation, we have next to notice the arguments urged from an anatomical and physiological standpoint.

"I believe, then," says Möbius, "that I have refuted on anatomical and physiological grounds, the opinion that Flying-fish use the pectoral fins as wings" (p. 368).

In this entire discussion, Möbius tacitly assumes that there can be but two opinions on this question, namely, his own opinion, which he shares with many others, and the opinion attributed, with more or less justice, to A. v. Humboldt, Kneeland and others, that the fins are flapped with great rapidity throughout the entire flight. While the claim to have refuted the latter opinion seems altogether too pretentious, it may be freely admitted that the reasons adduced have much more force against it than against the view here maintained, that the flapping movement is generally continued for only a part of the flight.

The frequency of the fin-strokes is made the first point of attack. Referring to the number of revolutions made by the bird's wing per second, which, according to Marey,* are for the Sparrow, 13; Wild Duck, 9; Pigeon, 8; Moor Buzzard, 5¾; Screech Owl, 5; Buzzard, 3; Möbius remarks:—"If Flying-fish make a still larger number of fin-strokes per second, then the fin-muscles must be able to contract even more rapidly than the pectoral muscles of birds and all other vertebrates."

Then follows a comparison of the muscles of certain fishes with those of mammals, birds and frogs, in respect to the time required to execute a muscular contraction—all with a view to showing that the muscles of *Exocœtus* are incapable of making very rapid contractions. The strength of this argument is impaired by two facts; 1st, the duration of a muscular contraction has never been determined for *Exocœtus;* and 2nd, the number of fin-strokes per second has never been estimated, much less experimentally ascertained.

Furthermore, it does not follow, as Möbius asserts, that if the Flying-fish make more than thirteen fin-strokes per second, its fin-muscles must be able to contract more rapidly than those of birds. That they would be more rapid than those of some birds under some circumstances, can be safely asserted, and nothing more. The number of revolutions made by the Sparrow's wing in a second is greatly exceeded in the wing of the Humming-bird; and the figure given by Marey does not represent the maximum number of strokes of which the Sparrow's wing is capable. A complete "muscle-curve" consists of a "latent period," a contraction and a relaxation, as every tyro in physiology knows, and the last two phases may vary much in duration according to circumstances.

Again, the size of the fin-muscles is said to be incompatible with the theory that the fins execute true flight.

The average weight of the entire bird, as determined by Harting for thirteen birds belonging to different orders, is 622 times that of the pectoral muscles. In the case of *Chiroptera,* according to the Dutch physiologist, the body weighs 136 times as much as the pectoral muscles; and the relation between the same in *Exocœtus* was found by Möbius to be as 32·4 : 1.

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* 'Animal Mechanism,' p. 228.

If the work performed by the muscles of flight be proportional to the weight of the body, then, as Möbius observes, the pectoral fin-muscles of *Exocœtus* must develop about five times as much force as the pectoral muscles of birds, and about two and one-half times as much as the same muscles of the bats.

The objection from this point of view has been greatly overestimated by Möbius. As Flying-fish generally move their pectorals during only a part of their flight, which is at most short, they do not need to expend so much muscular energy as birds and bats, which take long-continued flights. Small muscles may perform, for a brief period, work which only larger muscles would be able to perform for a long time. Möbius seems to have overlooked the fact that time, as well as size, is an element of this problem.

Perhaps also the large air-bladder may, as Humboldt supposed, have something to do with lightening the work of the muscles, while serving as a store-house of oxygen.

The experiment of Humboldt, by which he determined that the fin-rays of *Exocœtus* move with five times greater force than the rays of other fins, would seem to favour the opinion here maintained. Admitting that in form, size, length, and structure, the pectoral fins of *Exocœtus* are less well adapted to flight than the wings of most birds, there is still ample room to believe, on anatomical and physiological grounds alone, that they are capable of executing true flight.

In regard to the personal observations of Prof. Möbius, it may be said that they can lay no claim to the right of deciding this question. Whatever evidence they afford is of a purely negative character; and of this fact Prof. Möbius seems to be fully aware, if we may judge from the stress which he lays upon other considerations. That he and others may not have been fortunate enough to recognise the wing-like motion of the pectorals, establishes at most only a probability, which weighs very little against the positive evidence afforded by the testimony of those who have actually seen Flying-fish fly.

OCCASIONAL NOTES.

Mammals and Birds from Port Leopold.—In 'The Ibis' for 1878 (pp. 420–442) Mr. Henry Stevenson published a paper containing the observations of the late Surgeon Edward Adams on the birds of Michalaski, and in the same paper he gave a memoir of the brief but eventful career of this talented officer. Mr. Adams entered the Royal Navy as Assistant Surgeon in 1847, and, having volunteered for Arctic Service, was appointed to the 'Investigator,' Captain E. J. Bird, which vessel, in company of H.M.S. 'Enterprise,' sailed from England for Lancaster Sound and Barrow Straits, in search of Sir John Franklin, on the 12th June, 1848, and returned to England in the following year. This Expedition, under the command of Capt. Sir James C. Ross, was greatly delayed on the outward voyage by bad weather and the unfavourable condition of the ice, and only reached Port Leopold on the 11th September, 1848, where it wintered in N. lat. 73° 50′, W. long. 90° 20′. Amongst the papers and drawings of the late Surgeon Edward Adams, which are now in the possession of Mr. Henry Stevenson, to whom I am indebted for an examination of them, there are but few notes referring to the eleven months' stay at Port Leopold, beyond a list of the animals obtained there. The mammalia mentioned by Surgeon Adams as obtained at Port Leopold are *Ursus maritimus*, *Canis lagopus*, *Arvicola hudsonius*, and *Cervus tarandus*. In all probability it is an oversight that no species of Seal is included. The list of birds, which comprises twenty-three species, would not possess any very special interest were it not taken in connection with the observations of others who have supplied us with ornithological records from three other localities to the southward of Port Leopold, almost on the same meridian of longitude, and along almost a continuous coast-line, but separated by four degrees of latitude, or about 250 miles. The authors referred to are Sir James C. Ross, who between 1829 and 1833 carefully worked out the Ornithology of Boothia; Dr. John Rae, who wintered at Fort Hope, Repulse Bay, 1846–47; and Dr. David Walker, Naturalist to the 'Fox,' who wintered at Port Kennedy, N. lat. 72°, W. long. 94°, in 1858–59. I have transferred from the note-book, now the property of Mr. Henry Stevenson, Surgeon Adams's list of birds, without any alteration in the synonymy or re-arrangement of the species:—*Strix nyctea*, *Merula* ——? *Corvus corax*, *Linaria minor*, *Emberiza nivalis*, *Tetrao rupestris*, *Tringa maritima*, *Anser brenta*, *A. Hutchinsii*, *Somateria spectabilis*, *S. mollissima*, *Harelda glacialis*, *Colymbus septentrionalis*, *Uria Brunnichii*, *U. grylle*, *Procellaria glacialis*, *Lestris Richardsonii*, *Larus Sabinii?* *L. glaucus*, *L. argentatus*, *L. leucopterus*, *L. eburneus*, *L. tridactylus*.—H. W. Feilden (Norwich Barracks).

Young Polar Bears at the Zoological Society's Gardens.—The Zoological Society has just received from Mr. Leigh Smith a valuable present in the shape of two young Polar Bears, which that gentleman brought home in his steam yacht 'Eira' (a vessel of 350 tons) on his recent return from the Arctic regions. He and his companions, with a crew of twenty-five, sailed from Lerwick on June 22nd, and a week later were facing the ice about Jan Meyen Island. They then steamed N.E., to be confronted speedily by the impenetrable main pack. Changing their course to the S.E., and coasting the edge of the pack they fell in with numbers of Bladder-nosed Seals, a great many of which were shot. Failing to find an entry through the increasing packs, they worked the ship to the westward, only to get mixed up in fog and ice together, and to battle their way out again. The northward was tried, but after many attempts to break through the pack, they had to 'bout ship and return to the open sea. Here they met with a strong gale which lasted three days, and compelled them to take shelter in Magdelen Bay, Spitzbergen. Afterwards, clearing the South Cape they ventured southward, to meet the relentless barriers once more, and to be compelled to a south-westerly course. Then they pointed their vessel northwards, and made attempts to find a passage through the ice between 77·14 and 79.4 latitude. Driven off by a violent gale, they approached the ice-girt land in still another direction: this time to find an island, where they caught seventeen Walrus and some Snow-birds, *Pagophila eburnea*. Several more islands were discovered, and also a splendid harbour between two of them, which was named, after the yacht, Eira Harbour. They made various trips from this safe anchorage, reaching as far as 80·20 north latitude, killing eighteen Polar Bears, besides capturing the two young ones above referred to, which, with the surviving Snow-bird, were sent to the Zoological Gardens. Leaving the harbour, they had to follow the coast to the north-west, but had again to give up in consequence of the ice dragging the ship with it. By this time the short summer season was exhausted. Having got into the ice regions, the difficulty now was how to get out of them. This was accomplished by steering in turn in the direction of almost every point of the compass, until at last the adventurous steam-yacht reached Norway, to be flung ashore on a reef at the entrance of Tiel Sound through the incapacity of a pilot. Towed off after some difficulty, the vessel reached Peterhead on the 12th October, where, it is understood, the Eira is only to remain until the opening month of next year, when Mr. Smith will renew his researches. Immediately on his arrival, Mr. Leigh Smith telegraphed to Mr. Bartlett to know if he would accept for the Society the two young Polar Bears, and if so to send for them at once. Mr. Clarence Bartlett accordingly proceeded to Peterhead, where he found the Bears already packed in two large casks; the head of each cask having been knocked out and fitted with iron bars. The Bears were at once brought direct to London by a fast train from Peterhead, and may now be seen in one of the Terrace Dens in the Zoological Gardens, close to the den of their larger relative, which, if we mistake not, was also presented by Mr. Leigh Smith. These young bears are at present about the size of sheep, and, with the exception of some slight contusions about the head and face, caused doubtless by their attempts to escape from on board ship, they appear in excellent health and condition, and likely to do well. They certainly form an attractive addition to the Society's already rich collection of Carnivora.—J. E. Harting.

The Young of the Ivory Gull.—It was with much interest that I examined the young Ivory Gull, *Pagophila eburnea*, now living in the Eastern Aviary of the Zoological Gardens, and which, with two young Polar bears, had been brought back by that successful Arctic explorer, Mr. Leigh Smith, from his late cruise as far as the shores of Franz-Josef Land, first discovered by the Austro-Hungarian Expedition. This is, I believe, the first specimen of the bird ever received by the Zoological Society, and is by far the youngest that I have ever had the good fortune to examine. Most ornithologists were aware that the adult was pure white, and that the immature birds in the previous plumage were white, more or less spotted with blackish brown on the back, wings, and tail, in some cases also showing some dark colour about the base of the bill and the lores. The individuals with this kind of indistinct "mask" were, however, the youngest known to us, no earlier plumage being described by Mr. Dresser in his grand work on the 'Birds of Europe.' Many of your readers may be surprised to learn that the young Ivory Gull in its first plumage is mainly of a smoke-grey, nearly as dark as a Fulmar Petrel on the upper parts, and especially so on the tail-coverts, the feathers of the the back and wing-coverts being striated, and the head bearing not merely a mask, but a short hood of a darker grey than the neck and the under parts. In fact, so much did the specimen in question resemble a young Fulmar, that my first thought was to scrutinize his bill; that was quite "in order," and he gave me every opportunity of observing it by attempting to devour my fore-finger; but his hinder parts he did not care to show, being perhaps conscious that his tail was somewhat defective, owing to abrasion. The tone of the grey colour may perhaps have been deepened by the dirt acquired on board the steam-yacht, where he is said to have frequented the stoke-hole, but he has been constantly washing since his arrival in the Gardens, and there can be no doubt that the above is a rough description of the normal plumage of this gull at from three to four months old. I was not unprepared for this, having been told by those who have visited Spitzbergen that the young were quite dark; but it was one of those things not generally known, and the presence of the hood is both new and interesting. In this respect the young Ivory Gull resembles the South-American Gulls, *Larus fuliginosus*, *L. belcheri*, *L. tenuirostris*, *L. scoresbii*, the Californian *L. heermanni*, and the Japanese *L. crassirostris*, all of which have more or less of a hood in the immature stage, and lose it as they grow older. I may perhaps be allowed to repeat here my remarks (Proc. Zool. Soc., 1878, p. 162) on the genus *Pagophila*, viz., that "The short stout bill, coarse rough feet with serrated membranes, much excised webs, and strong curved claws, appear to entitle this species to generic separation. The hallux is connected on the inside of the foot by a serrated membrane with the inner toe, a peculiarity which I do not recollect seeing noticed elsewhere."—HOWARD SAUNDERS (7, Radnor Place, W.).

RARE BIRDS AND THE AUTUMNAL MIGRATION.—It is not unworthy of record that several rare species of birds have reached our shores this autumn about the same dates. Thus, a number of Great Snipes have been recorded from England; I have myself seen two Snipes here, on the 27th September, which I feel confident were of this species, and one I have a record of was shot at Darmore Castle, Northumberland, on September 21st. As is now pretty well known to naturalists, the Great Snipe during summer is an inhabitant of the northern parts of the Old World. A Turtle Dove has been procured at Stonehaven, Kincardineshire, and was received for preservation by Mr. Robert Small, Edinburgh, on the 21st September. The breeding range of this species on the Continent of Europe extends north as far as 60° N. lat. in Russia, and somewhat farther north in Scandinavia. A Red-legged Hobby has been procured, and was sent in to Mr. Small on the 20th September. In the summer season this species occurs as far north as Archangel in Russia. An Esquimaux Curlew was shot on a hill in the Forest of Birse, Kincardineshire, on September 21st, and was sent in to Mr. George Sim, naturalist, Aberdeen, for preservation. The Esquimaux Curlew is an inhabitant, during the breeding season, of the Hudson's Bay Territories and Arctic North America; but neither the Turtle Dove, Red-legged Hobby, nor Great Snipe, so far as is known, occurs in the breeding season in North America. It seems suggestive of the route by which North American species visit England and Scotland and certain parts of Continental Europe, that these species appear together, brought over by the same winds, about the same time. I think it will be found before long that the old idea that birds from North America have reached Europe for the most part *viâ* the N.W., striking the Norwegian coast, and rebounding, as it were, upon the coast of Aberdeenshire, will be given up, and the later one adopted, namely, that the greater part, if not all, come to us from the far north-east. I exclude from this general statement, or theory, however, the *Natatores*, whose movements, so far as we are aware, proceed during autumn migration from north to south, as nearly as possible, and *not*, like land birds and waders, from east to west. The data we have are not, perhaps, in their present unarranged and perfect state, sufficient to enable us to lay this down as a law of autumnal migration. My object is to draw attention to prominent facts and coincidences such as are given above, and thus more fully to direct attention to phenomena of migration. I would take the opportunity of soliciting aid from Scottish observers, as one of a committee lately appointed to investigate the phenomena of migration of birds and to collect statistics. Notes from England should be sent to Prof. Newton, Magdalene College, Cambridge, and to John Cordeaux, Great Cotes, Ulceby, Lincolnshire.—J. A. HARVIE BROWN (Dunipace House, Larbert, N.B.)

MIGRATION ON THE EAST COAST OF ENGLAND IN THE AUTUMN OF 1880.—As a sequel to Mr. J. A. Harvie Brown's remarks, I may observe that the arrival of these rare wanderers on our coast in September was probably caused by the strong N. and N.E. winds blowing during the third week in September. On Heligoland it is these winds which bring the birds down from N.E. Europe and the Asiatic tundras; with westerly or south-westerly winds blowing, no birds turn up for days together. From some cause or other, many of our immigrants arrived on the east coast much before they were due. Thus Knots were seen in large flocks in the Humber on August 16th. An old male Knot in summer plumage was killed against the telegraph-wire on Kilnsea, near Spurn, on July 24th. A large flock of Fieldfares, as I hear on the best authority, were seen in Norfolk on September 9th, and Golden-crested Wrens at Spurn on September 15th, their average time of arrival being about October 12th. A peculiarity of the season has been the immense number of Wheatears and Redstarts on the coast from Flamborough to Yarmouth during the last week in August and first week in September, full particulars of which will I hope appear in the next report on migration.—JOHN CORDEAUX (Great Cotes, Ulceby).

AVOCET IN SOUTH DEVON.—Some forty years since a bird of this species was shot in the Kingsbridge Estuary, of which I became possessed. Since then I have neither seen nor heard of one occurring in this district until the 2nd of the present month (October), when a person shooting on the estuary saw three on the mud. He was induced to follow them up, and got a shot, which resulted in his killing one and wounding another; the former was brought to my brother, Mr. R. P. Nicholls, who purchased it, and on the following day the wounded bird was picked up dead, and also came into our possession. On dissection the larger specimen proved to be a male; its weight, 10½ ounces; length, 17 inches; breadth, 30 inches. The other, a female, weighed 9 ounces; length, 15¾ inches; breadth, 29 inches. Mr. E. Elliot, a young and promising ornithologist, being anxious to procure the other specimen, followed it up for a day or two, and finally succeeded in shooting it; this bird is also a female. Mr. Elliot states that he had a good opportunity, with the aid of a telescope, of watching it feed, which it did in an easy and graceful manner, with rather slow and measured strides, and passing its head from side to side, scooping up the mud, and occasionally throwing up its head and swallowing what it had taken. It flew with the head and neck extended, which differs from some descriptions given. Some Grey Phalaropes and Arctic Terns have also occurred, and early in the spring a pair of Grey-headed Wagtails, *Motacilla flava* (male and female), were procured in the neighbourhood.—HENRY NICHOLLS (Kingsbridge, South Devon).

AVOCET IN CORNWALL.—On August 21st a specimen of the Avocet, *Recurvirostra avocetta*, a young male of the second year, was shot on the River Fal, near Truro, by Mr. Drinkwater, of that place, who has sent it to Mr. Gill, taxidermist, of Falmouth, for preservation. The late Edward Hearle Rodd, in his 'Birds of Cornwall and the Scilly Isles' (p. 262), says:—"This prettily pied bird has become comparatively rare throughout the kingdom since the drainage of the fen lands has been perfected, by which not only their feeding grounds, but their natural breeding haunts, have been destroyed"; and on page 91 he says, "A very rare visitor to Cornwall." This, I believe, makes the third instance in which the Avocet has been obtained in Cornwall. Notices of previous captures will be found in the work quoted.—HERBERT P. HART (Polbrean, The Lizard).

DOES THE LONG-EARED OWL HOOT?—Not only the Barn Owl, but also the Long-eared Owl, is credited with hooting, and this, too, upon respectable authority; as may be seen on reference to a well-known book, St. John's 'Wild Sports and Natural History of the Highlands' (chap. vii., p. 65, edit. 1847), where the author says of the Long-eared Owl:—"His long ears and bright eyes give him a most unbird-like appearance as he sits watching one. As soon as evening comes on, this Owl issues forth in full life and activity, and in the woods here may be seen and heard in all directions, sitting on the topmost branch of some leafless tree, generally a larch or ash (these two being his favourites), where he hoots incessantly for an hour together, swelling his throat out, and making the eccentric motions of a pouter pigeon." Mr. St. John, on the same page, speaks of the Tawny Owl, as "hooting as vigorously at midday as at night," and says that he has frequently heard this kind of Owl (the Tawny) hoot and utter another sharp kind of cry during the daytime, in the shady solitudes of the pine woods.—A. G. MORE (Dublin).

SUBCUTANEOUS WORMS IN RED-BACKED SHRIKE.—Last June at Kissengen I shot two Red-backed Shrikes, *Lanius collurio*. On skinning one I found a great number of small worms between the skull and skin, ranging from about one to two inches in length; some hard, round, white, and pointed at head and tail; others broad and flat at one end for nearly half their length, then suddenly narrower. In the case of the other I found two worms, two inches and a quarter or more, between the throat and skin; these were all similar to the hard round worms mentioned above. Both birds were in good condition.—E. F. Becher (Southwell, Notts).

[We should have been glad to have received specimens, which might have been forwarded safely in a small test-tube filled with any kind of spirit.—Ed.]

The Trachea of the Spoonbill.—Messrs. Pratt & Son, of Brighton, have had two Spoonbills sent to them for preservation. One was shot at Littlehampton on October 9th, the other at Shoreham on the 11th. Yarrell, in the third edition of his 'British Birds,' mentions that the trachea of the Spoonbill has "a figure of eight" convolution in front of the lungs. Montagu, in his 'Ornithological Dictionary,' also mentions this convolution, which he says occurs before the trachea enters the cavity of the chest. I examined the bodies of both the birds (one of which was certainly a male, and the other was shot and rather decomposed about the loins, but was also, I am almost certain, a male), but in neither of them did I find the convolution mentioned. As Montagu has expressed his surprise that Willughby did not observe the reflections of the windpipe in the bird he examined, it may be interesting to your readers to know that it was wanting in both the specimens examined by me.—Herbert Langton (Brighton House Dispensary, Queen's Road, Brighton).

[Yarrell has referred to certain instances in which this peculiarity was absent.—Ed.]

Blackcap in Co. Meath.—I have just received a Blackcap Warbler, which was shot at Oldcastle, Co. Meath, by Mr. Alfred Blandford. This is, I think, the only instance noted this year of the occurrence of this bird in Ireland. The specimen in question is a fine adult male, and was chasing another of the same species when shot by my friend.—Charles W. Benson (Rathmines School, Dublin).

[The Blackcap is a regular summer visitant to Ireland, but is very local there.—Ed.]

Rough-legged Buzzard near Blackburn.—On the 11th October Mr. J. E. Hoyle, of this town, shot a Rough-legged Buzzard on Haslingden Moor. The bird, which is an extremely rare visitant to this district, is an immature male in capital plumage.—Robert J. Howard (Blackburn).

Shore Lark near Brighton. — Messrs. Pratt have, alive at the present time, a Shore Lark, in splendid plumage, which was caught near Rottingdean by some birdcatchers, on the 16th October. — H. Langton (Brighton).

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

Entomological Society of London.

September 1, 1880.—H. T. Stainton, F.R.S., Vice-President, in the chair.

Miss Emily A. Smith, Assistant State Entomologist of Illinois, of Peoria, Illinois, was ballotted for and elected a Foreign Member.

Mr. J. Jenner Weir exhibited a male *Odonestis potatoria* having two-thirds of the upper wings of the yellow colour of the female, and a female of the same species of the usual dull red colour of the male: also a male *Smerinthus Populi*, having the wings almost without markings, and of the light colour generally found in the female, the right antenna being clubbed at the extremity, and not pointed as usual.

Sir Sidney Saunders exhibited six winged examples of the Stylopideous genus *Hylechthrus*, five having been obtained from the specimens of *Prosopis rubicola* exhibited alive at the last meeting, one of the latter having produced two of the former. Four adult larvæ of males were found in another of the same bees which became arrested in its development in the pupal stage. He also exhibited several of these bees having females of *Hylechthrus in situ*, and the puparium of a male extracted entire with the imago enclosed therein; also various Hymenoptera obtained from the same briars, among which were specimens of the Chalcideous genus *Melittobia*, and a new species of *Scleroderma*.

Four other species of *Sclererdoma* from Greece are recorded in Professor Westwood's monograph of this genus published in the second volume of the 'Transactions,' 1837—1840. This species is also met with in Corfu in the dry snags of fig-trees during winter.

Miss E. A. Ormerod exhibited some galls found on *Tanacetum vulgare*, and stated that Mr. Fitch had obtained some of a similar kind last year near Maldon, Essex; but the present specimens were peculiar from the gall-growths being not only in the axils of the leaves, but also on the midribs and pinnæ and on the inflorescence. The galls on the leaves are smaller than the others and solitary; those into which the axillary growth of shoots has merged itself are for the most part confluent, forming bunches of as many as seven solid bell-shaped galls grown together at the sides, or sometimes completely surrounding the main stem. In the inflorescence also as many as six or seven galls may be found on the receptacle of the composite flower, these being generally single, but occasionally confluent, and frequently bearing one or more florets on the side of the gall. The galls vary much in size, those on the leaves being only about three-sixteenths of an inch long, whilst the axillary ones are from about three-eighths to half an inch in length, and those on the flowers of intermediate size. The width is also variable, and depends on the condition of the gall; in the normal state it is about three-quarters of the length, and the gall is bell-shaped, swollen at the base and more or less contracted above, but again spreading at the upper extremity, which is prolonged into several pointed segments, giving the gall much the appearance of a miniature seedhead of *Aquilegia* in reversed position. The gall is depressed in the centre between three segments, where it is also covered with white downy hairs. The colour is green, in some cases turning to purple towards maturity. Internally it is fleshy and solid, with one cavity in the middle of the most typically formed galls, but from their distortion and confluence there may be more. In some of the specimens this chamber communicates by an aperture with the downy depression above, and contains a brilliant orange or scarlet larva, much resembling that of a *Cecidomyia;* whether it is of that genus remains to be seen, as apparently the gall and its tenant are as yet undescribed. The specimens exhibited were found about the 24th of August on the bank of the Brent Canal, near Brentford, on one clump of tansy growing immediately above the water, and the largest numbers were in the inflorescence of a stem which was lying partly in the water with the flower-head a few inches above the surface.

Mr. T. R. Billups exhibited a female specimen of *Polyblastus Wahlbergi*, an Ichneumon new to Britain, taken at Ashstead. A male had previously been captured by Dr. Capron.

Mr. E. Boscher exhibited living specimens of the two varieties of the larva of *Smerinthus ocellatus*, and read the following note:—

"I exhibited last October coloured drawings of *Smerinthus ocellatus*, showing the marked difference between those feeding on *Salix viminalis* and *S. triandra* (Proc. Ent. Soc. 1879, p. xliv). I have now brought for exhibition some living caterpillars found feeding respectively on *Salix viminalis* and apple. I wish particularly to draw attention to those on the *Salix*, of which I found about a dozen feeding on the same plant, and all marked with brown spots. Others which I found on another species of *Salix*, in an osier-bed some little distance off, were of the ordinary bluish green form without the brown spots, and identical with those found on apples."

Mr. Meldola exhibited some specimens of *Camptogramma bilineata*, a large number of which had been found by Mr. James English near Epping attached firmly to the leaves of the "tea-tree" (*Lycium barbarum*) by the abdomen, in which position they had died, possibly from the effects of a fungoid disease.

Mr. A. H. Swinton communicated a note on *Luciola Italica*.— R. MELDOLA, *Hon. Secretary*.

NOTICES OF NEW BOOKS.

Modern Wildfowling. By "WILDFOWLER," of 'The Field.' 8vo, pp. 511, with numerous illustrations. London: 'The Field' Office. 1880.

COL. HAWKER's 'Instructions to young Sportsmen in all that relates to Guns and Shooting' has long been a text-book on the fascinating pursuit of wildfowling, and having passed through at least a dozen editions, must be familiar to everyone who carries a gun. It is full of practical information, much of which is useful at the present day, but having been written just fifty years ago, that portion of the work which relates to guns has naturally grown somewhat antiquated. The vast improvements which have been made in guns of all kinds since the introduction of the breech-loading system has completely revolutionised the notions which were current in Col. Hawker's day.

The same cannot be said of Mr. Folkard's excellent book, 'The Wildfowler,' for this is a more modern work, and one with which no one can dispense who aspires to be an adept in the art of which it treats. Nevertheless this writer has left untrodden a good bit of ground that has now been covered by "Wildfowler" in the work before us. The three volumes seem practically to supply all that can possibly be needed on the subject. "Wildfowler," availing himself of the teaching of his predecessors, has confirmed or refuted the results of their experience by his own, and pointing out the modifications which in many respects have been rendered necessary by modern improvements, has augmented the literature of the subject by much original and practical information. His book, which is an illustrated reprint of articles contributed to 'The Field,' deals not only with the various modes of approaching or decoying and killing wildfowl of all kinds, but enters in minute detail upon the construction of punts, both single and double-handed; sails; punt-guns, muzzle-loading as well as breech-loading; recoil apparatus; and shoulder-guns of all patterns, with the varying loads required for different bores. In addition to this are several chapters devoted to a narration of adventures of the author while in pursuit of wildfowl both at home and abroad, which are very pleasant reading.

As an example of his style we may quote the following passage, which occurs at page 206:—

"Now, for this sort of night work, in open weather, the staple fowl one kills are Widgeon. It is well known that Ducks, Pochards or Dunbirds, Teal, &c., at flight time resort to inland ponds, rivers, streams, and lakes. This they will do invariably at sunset. But, when the frost is severe, and has lasted some time, then the Ducks, Teal, &c., are, perforce, driven to seek their food elsewhere; and, as the saltings alone never freeze (being twice a-day covered by the tide), there they all repair for their feed, and in such weather there they may be found with the other fowl. But, except under such circumstances, the vast majority of fowl killed over saltings are Widgeon; at times, however, Pintails and Teal remain with them. The whistle of the cock Widgeon is not unlike the words 'wee—oh!' softly undulated—hence the name 'whew' given them by old naturalists; but, unless set to music, it is impossible to give an idea of its intonation. I had once a musical friend with me in a punt, purposely to get the notes of birds set to music, and he got them so faithfully that he afterwards reproduced their calls marvellously well. He wrote them down for me, but I have mislaid them now. The calls, of course, greatly vary with the spirit of gregariousness, which, in Widgeon, as in men, increases in direct ratio with hard times. Yes, strange as it may seem, it is so. In mild, open weather, the birds scatter themselves over the flats, and do not trouble much about each other, so much so that it is very rare that one gets a good shot at them then, for two reasons: (1) being all dispersed, a good rake cannot be had; (2) just when you are trying to make out the bulk of the 'company,' some outlying birds will scream an alert, and the lot are gone! In very hard times, on the contrary, Widgeon crowd together, call themselves together, and stick together; and the harder the weather the tighter they close, partly for warmth's sake and security's sake, doubtless, and also because, when one has found a good place, they all want to wrest it from him—just like men.

"The greediness with which such crowds feed, however, tells greatly against them; for, once at it, they do not readily leave off, and the big guns then come into play. If a punter is very cautious in his working, he cannot fail to detect Widgeon feeding, even if they do not call—which sometimes occurs when they are very hungry—by listening for the noise of their bills. Now, when the tide is ebbing, anything sounding like dripping water should be at once investigated, because—although it might be some puddles on the flats emptying themselves in a latch or a creek—it might also be Widgeon feeding, and the two noises, at a distance, are exactly similar. If, therefore, the shooter listens patiently, and the noise is produced by birds, he will soon hear some 'charming' from them, which will conclusively set his mind at rest; or if he looks up carefully, he may perchance discover their whereabouts at once. But he must proceed very carefully when so doing, and he must regulate his actions by their noise and motions. Thus, if the feeding stops, he should stop; then some old cock will probably call, the hens will coo softly in answer, and soon the host will feed again, when the paddles or the setting-pole may be resumed; but, should the punter observe some birds walking away from him, the case is getting critical. The fact is, these birds have not made out yet what cause of alarm they may have; but they have heard something, and are distrustful, and, at the slightest further cause, the lot will take to their wings. It requires then perfect silence for a few minutes on the punter's part; for, no sooner have the suspicious birds begun their evolutions than the whole company throw up their heads to look up and listen also, and, with so many sharp pairs of ears listening and eyes looking, it behoves the shooter to be extra quiet. Indeed, sometimes, notwithstanding all his carefulness, the company rise and sheer off; but, if the harbour is quiet, and no shot has been fired, they may perhaps settle again further on on the flats; and indeed, I once had a second shot myself within a few moments at the same company settling again near the cripples of my first shot; but such are exceptional cases."

If we have one fault to find it is that, although the author has plenty of material, it is not so well put together as it might have been—not sufficiently concise. Many of the chapters might be considerably curtailed without any detriment to the work, and instead of reprinting the voluminous correspondence and criticisms which appeared in 'The Field' on "Wildfowler's" articles as originally published, it would have been much better if the author had briefly stated general results, or better still, re-written his articles, embodying in them all such additions by correspondents as might seem to him of real practical value. By so doing he would have saved much repetition, and would have presented his facts more clearly and forcibly to the reader.

The chapter on the close-time for wildfowl and seafowl (p. 458) seems to have been written, unfortunately, just before the passing of the recent Act for the Protection of Wild Birds, the text of which was given in the last number of 'The Zoologist.' So that the information there afforded concerning Statutes since repealed is not now needed. In a future edition doubtless the author will substitute the text of the Act now in force, with such comments thereon as will suggest themselves to his practical mind. In any new edition, also, we would strongly urge the desirability of furnishing a good Index, the absence of which, from the volume just issued, detracts not a little from its utility. With this addition sportsmen will have a capital *vade mecum* on the art of Wildfowling; but it is to be hoped that the provisions of the Act for protecting the birds during the close-time may be as rigidly observed as the directions here given for shooting them in their proper season, or before many more winters have elapsed the wildfowler's occupation may be gone.

Glimpses of Bird-Life; pourtrayed with Pen and Pencil. By J. E. Harting and L. P. Robert. Folio, with twenty coloured plates and forty-three woodcuts and initial letters. London: Sonnenschein & Allen. 1880.

How few artists there are capable of accurately delineating bird-life is only too well known to those ornithologists who, on the eve of publication, have had occasion to require their services. A glance at any of the recently published "Monographs" by members of the British Ornithologists' Union, or at the 'Transactions' or 'Proceedings' of the Zoological Society, or at some of the more important books on Natural History which appear from time to time illustrated with wood engravings, reveals the fact that there are barely half-a-dozen such artists to be found in London. On the Continent, apparently, the case is not very different, if we may judge by the specimens of coloured plates and engravings which reach us from France, Holland, and Germany. The engravers and lithographers, as a rule, both here and abroad, do their work well, so well, indeed, that very often it could not be better; but, as a matter of course, they follow scrupulously and conscientiously the lines of the artist, and if these are faulty the whole effect is marred. The great difficulty is to find a zoological artist who has been able to afford the time to make his studies *from nature;* who declines to be fettered by the conventional outlines of predecessors, and who will put on paper only what he knows or believes to be correct from personal observation or study.

Under these circumstances we hail with satisfaction the advent, to the ranks of this minority, of an artist who can produce such good work as that presented in the volume before us.

M. Robert is a Frenchman who has made a special study of bird-life, and who has acquired the happy knack of hitting off attitudes which are at once characteristic of the species delineated by him, and thus imparting to them a life-like appearance which is heightened by the general accuracy of his colouring. We are not over-rating M. Robert's work when we say that these French chromo-lithographs, which are far in advance of anything of the kind hitherto produced in England, come nearer to the hand-coloured lithographs of Messrs. Wolf and Keuleman's than any we have yet seen.

The birds figured in the present volume are all life-size, and include half-a-dozen species of British Titmouse, the House and Tree Sparrows; the Brambling, Chaffinch, and Greenfinch; the Hoopoe, Thrush, Blackbird, and Nightingale; the Redbreast, Goldcrest, Garden Warbler, Blackcap, and Whitethroat; in all, twenty species of birds which are, or should be, familiar from their attractive appearance, their song, or their general utility to man as a cultivator of the soil.

An account of each has been furnished (by the Editor of this Journal), in which, it is hoped, there will be found enough information on the haunts, habits, food, nidification, and migration of the different species to interest the reader without boring him.

It has been thought preferable in a work of this kind, wherein the plates form the chief attraction, to give brief but comprehensive sketches of the natural history of the species noticed, rather than descend into minute particulars and comparisons which, however interesting they might prove to practical ornithologists, would probably not entertain the general reader.

As the plates now published comprise only about a third of what M. Robert has finished, the publishers contemplate the issue of another series, should the present work find sufficient favour in the eyes of the public.

Bright Feathers; or, Some North-American Birds of Beauty. By Frank R. Rathbun. Illustrated with drawings made from nature, and carefully coloured by hand. Part. I. 4to, pp. 24, with one coloured plate. Auburn, N.Y.: published by the author. 1880.

In the Introduction to Part I. of this work, the author informs us that "the series is intended to include ten or more species (in as many parts) of such birds as are found in the North-Eastern portions of the United States most attractive for their plumage colorations; and the plates will contain figures of the female as well as the male of the species under advisement."

The part just issued is devoted to an account of the Purple Finch, *Carpodacus purpureus*, of which a life-sized plate is given. Much care and evident expense has been bestowed in the preparation of this work, and the type and paper are all that can be desired. We regret that we cannot say as much for the text and its accompanying illustration. In the former we do not find so complete and satisfactory an account of the bird selected as one would naturally look for and expect in a work which is announced to deal with so very limited a number of species. There are no new facts in its natural history disclosed, nor have the materials collected on the subject of the memoir by well-known writers on American Ornithology been utilised as they might have been with advantage.

We are even more disappointed with the plate, the hard, unbroken outlines and crude colouring reminding us of the fish-like figures of birds with which natural-history books were wont to be illustrated fifty years ago. This is not as it should be in these days when so much improvement has been made in lithography and colouring.

Mr. Rathbun is apparently a great enthusiast, and we do not doubt the labour which he has bestowed in the preparation of his work; but in undertaking to illustrate it himself, he has shown that he is less skilful as an artist than as a writer.

We commend to his notice such works as Wolf's 'Zoological Sketches,' Buller's 'Birds of New Zealand,' Sharpe's 'Kingfishers,' Marshall's 'Barbets,' Shelley's 'Sun-birds,' Sclater's 'Jacamars and Puff-birds,' Legge's 'Birds of Ceylon,' Dawson Rowley's 'Ornithological Miscellany,' Salvin and Godman's splendid work on the Fauna of Central America, and Gould's magnificent folios; a glance at any or all of which will show him how birds can and may be drawn, and will convince him that critics now-a-days have good reasons to be fastidious on the subject of zoological illustrations.